

REMARKS

Claims 1, 3-13, and 21-26 were pending before entry of this amendment.

Claims 1, 3-13, and 21-26 are rejected.

Claims 1, 3-5, 8-13, 21-26 are rejected under 35 U.S.C. 102(e).

Claims 6-7 are rejected under 35 U.S.C. 103(a).

Claims 11, 12 and 23 are cancelled hereby, without prejudice. Claims 1, 3, 13, 21, 22 and 24 are amended hereby. New claims 37-34 are added hereby. No new matter is added.

Claims 1, 3-10, 13, 21, 22 and 24-34 remain in the case for consideration.

Applicant requests reconsideration and allowance of the claims in light of the above amendments and following remarks.

Claim Rejections – 35 U.S.C. § 102

Claims 1, 3-5, 8-13, and 21-26 are rejected under 35 U.S.C. 102(e) as being anticipated by Wennemuth et al. U.S. Patent No. 6,768,191 ("Wennemuth").

Applicant respectfully traverses the rejections.

Amended claim 1 clearly distinguishes over the prior art of record including Wennemuth, which teaches a bent circuit board 8 that wraps around the sides of and extends along the entire width of and well beyond his substrates 3 at either sides thereof (Fig. 4 incorporated by the Examiner at page 3 of the Office action). Claim 1 instead now expressly recites "circuit patterns terminating in a plurality of connection pads formed outside the area in which the ball land pads are formed, the circuit patterns and the plurality of connection pads... electrically connected to the ball land pads ... wherein the circuit patterns on the lower surface of the substrate of the upper stacked chip scale package are electrically connected to the circuit patterns on the lower surface of the substrate of the lower stacked chip scale package *by ends of stack package side-connecting boards* having wiring patterns electrically connected to the plurality of connection pads of the circuit patterns on the lower surface of the substrate on the upper stacked chip and to the plurality of the connection pads of the circuit patterns on the lower surface of the substrate of the lower stacked chip."

The claim 1 amendments are supported by Figs. 4-6 and at page 5, lines 4-6 and lines 14-16. No new matter is added. Thus, applicant submits that amended claim 1 clearly distinguishes over Wennemuth and is allowable. Claims 3-10 and 13, which depend from allowable claim 1 also are allowable.

The Examiner hollowly asserts that claims 11 and 12 are taught by Wennemuth, reciting applicant's limitations at the bottom of page 4 of the Office action but failing even to attempt to read the recited limitations on Wennemuth or to point to where in Wennemuth such teachings can be found.

Wennemuth discloses no "connection pads" *outside* the region of the substrate on which his ball land pads are formed, and applicant defies the Examiner to point out where in Fig. 4 or any other figure or text of the Wennemuth such is even remotely suggested. As is pointed out above, Wennemuth relies on solder balls for each two-ship stack for his inter-substrate electrical connections via curved PCBs 8, which make their connections *inside* the region of the substrate on which his ball land pads are formed. *Thus Wennemuth teaches precisely the opposite of the structure recited in claims 11 and 12.*

Applicant hereby amends claim 1 to recite the distinguishing limitations of original claims 11 and 12 cancelled hereby without prejudice, to underscore the failures of the prior art teachings regarding the use of the connecting boards to electrically connect between stacked substrates mounting chips via "connection pads" located outside the region of the ball land pads. This important difference eliminates Wennemuth's long expanse of board 8 between adjacent stacked chip pairs and eliminates the need for double solder ball and ball land pads assemblies, which double connections increase cost and complexity while reducing reliability. Contrast the side coverage of applicant's substrates 121, 161 connected by bent connecting boards 190 attached to peripheral connection pads 126, 166 with Wennemuth's substrates 3 encircled by plural solder ball matrices and boards 8 extending between adjacent stacked pairs and thus necessitating double solder ball lands and double solder ball rows and much trouble caused by connecting his boards with his solder ball lands instead of with connection pads outside the region of his solder ball land matrices.

Claim 21 is amended hereby similar to amended claim 1 to recite first and second ball land pads matrices within defined first and second area and a plurality of first and second connection pads outside the same defined areas provided near the sides of each chip scale package with a circuit pattern on the lower surface of first and second substrates, the first and second connection pads electrically connected "via connecting boards attached to the first and second sides of the first and second chip scale packages." Thus, amended claim 21 also readily distinguishes over the prior art by its similar recitation as regards the side location of its connecting boards and electrical connection thereby with connection pads located outside a defined area within which ball land pads matrices are formed.

Support in the specification for amended claim 21 is the same as that for amended claim 1, as discussed above, so that no new matter is added. Claims 22 and 24-26 depend from amended and allowable claim 21 and thus are allowable as well. Specifically, amended claim 24 further distinguishes Wennemuth by reciting that solder balls need be formed "only on" the ball land pads of the first chip scale package, in keeping with applicant's Fig. 4. Applicant's stackable stack packages are asymmetric top to bottom—one (upper) face presents ball land pads for another solder ball matrix-equipped stack package (see Figs. 5 and 6), while the other (lower) face presents solder balls for I/O connections of the stacked chips, e.g. on a circuit or mother board. In contrast, Wennemuth teaches at Fig. 4 a rather confused symmetry by which his outer (upper and lower) chips present outwardly and wherein his four stacked chips are pairwise opposite facing, but wherein each presents a solder ball array to the outside world, necessitating extra solder ball lands extending along the upper and lower central stretch of his connecting board 8. One of ordinary skill would conclude from Wennemuth's Fig. 4 that no further stacking is contemplated or possible.

Applicant's recited structure contemplates the stacking above or below of a like chip scale package by the simple expedient of flowing the solder balls of one package (single chip package 210 in Fig. 5 or double chip package 400 in Fig. 6) onto the adjacent (lower) stacked chip package (100 in Fig. 5 or 300 in Fig. 6).

This advantage is brought out also in new claims 24-34 discussed below.

Claim Rejections – 35 U.S.C. § 103

Claims 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wennemuth in view of Karnezos U.S. Patent Application Publication No. 2004/0124518 ("Karnezos"). Suffice it to say that claims 6-7 depend from amended and allowable claim 1, distinguished above, so that they too are allowable. As admitted by the Examiner Karnezos adds only encapsulation and back-to-back chip adherence, while adding nothing more to the disparate teachings of Wennemuth.

Applicant respectfully traverses the rejections:

Amended claim 24 and new claims 27-34 are supported by Figs. 4-6, at page 4, lines 15-17 ("except that a plurality of solder balls 137 are formed only on the lower stacked chip scale package 110") and at page 5, lines 4-6 ("connection pads ... formed outside of the area in which the ball land pads ... are formed"). All recite in one form or another that the connection pads to which the connecting boards electrically connect as between two or more chip scale packages are outside the region of the substrate on which the plurality of ball land

pads are formed. *This of course exactly contradicts the teachings of Wennemuth, whose ball land pads and solder balls themselves supply the interior region attachment for his curved boards 8 and he provides no connection pads at all outside the ball land pads region of his substrate. As is noted above, this unfortunate prior art structure of Wennemuth requires double ball land pads, double solder balls, and an interior stretch of board 8 through the central region of his substrates and between adjacent substrates, thus greatly complicating further stacking.*

In a sense, Wennemuth's connecting boards are O-shaped, or round, since they extend all the way around his stacked chip arrays (necessarily, due to Wennemuth's failure to provide connection pads outside the region of his ball lands pads and instead to use the ball land pads and solder balls themselves to form the interconnection between the stacked chips). In contrast, and as clearly and consistently depicted in Figs. 4, 5 and 6, applicant's connecting boards, or flex circuit boards, 190 are C-shaped, having a vertical expanse along the sandwiched sides of the encapsulated stacked chips and having two relatively short horizontal expanses along the planar lower surfaces of substrates 121 and 161, the expanses describing a C-shaped expanse overall that readily distinguishes over Wennemuth's O-shaped board 8. Applicant claims this visually striking distinction over Wennemuth in new claim 29. (No new matter is added, since the drawings that show the clearly C-shaped connecting boards 190 are a part of the specification as originally filed and stand for whatever they show to one of ordinary skill in the art.)


New claims 30-34 develop this stackable stack package further, within the bounds of the original specification (showing and describing such building block and stackability features in connection with Figs. 4-6), with new claim 32 reciting the double-double stacked stack packages of Fig. 6). Applicant submits that all new claims are allowable for all the reasons discussed at length above, and urgently solicits reconsideration and allowance of all pending claims.

Conclusion

For the foregoing reasons, reconsideration and allowance of claims 1, 3-10, 13, 21, 22 and 24-34 of the application as amended or added hereby is solicited. The Examiner is encouraged to telephone the undersigned at (503) 222-3613 if it appears that an interview would be helpful in advancing the case.

Respectfully submitted,

MARGER JOHNSON & McCOLLOM, P.C.



Hosoon Lee
Reg. No. 56,737

MARGER JOHNSON & McCOLLOM, P.C.
210 SW Morrison Street, Suite 400
Portland, OR 97204
503-222-3613

Customer No. 20575

I hereby certify that this correspondence
is being transmitted to the U.S. Patent and
Trademark Office via facsimile number
571-273-8300, on April 18, 2006.



Li Mei Vermilya